News Release

Defense Advanced Research Projects Agency

3701 North Fairfax Drive
Arlington, VA 22203-1714
www.darpa.mil/newsroom

IMMEDIATE RELEASE May 6, 2009

DARPA KICKS OFF VULCAN ENGINE PROGRAM

The Defense Advanced Research Projects Agency (DARPA) has kicked off the Vulcan program with awards to four contractors. The four contractors participating in the eight-month first phase are: Alliant TechSystems, General Electric, Rolls Royce and United Technologies.

During the program's first phase, contractors will develop systems requirements for an operational Vulcan engine system, develop systems requirements and a conceptual design for a constant volume combustion (CVC) demonstration system, and develop a critical technology development plan to reduce risk on all key aspects of the Vulcan engine.

The Vulcan program is a propulsion system demonstration effort to design, build and ground-test an engine capable of accelerating a full-scale hypersonic vehicle from rest to Mach 4+. The Vulcan engine is critical to enabling full-scale hypersonic cruise vehicles for intelligence, surveillance, reconnaissance, strike or other critical national missions. It can serve as the low-speed accelerator for hypersonic vehicles that use turbine-based combined-cycle engines or as a stand-alone engine for Mach 0-4+ strike and reconnaissance aircraft.

The Vulcan engine will consist of an integrated CVC engine and a full-scale turbine engine. Contractors will choose from CVC engine architectures such as pulsed detonation engines, continuous detonation engines or other unsteady CVC engine architectures. The CVC engine will operate from below the upper Mach limit of the turbine engine to speeds of Mach 4+. Contractors will use a turbine engine that is a current production engine capable of operating at or above Mach 2, such as a F100-229, F110-129, F119 or F414 engine.

A CVC engine relies on a combustion cycle based on combusting fuel in a constant volume manner as opposed to traditional propulsion engines that burn the fuel in a constant pressure manner. CVC engine cycles offer potentially very significant performance improvements over conventional cycles, have the ability to operate statically through high Mach numbers and offer significant design flexibility. Constant volume combustion cycles are typically unsteady and incorporate multiple combustors and unique valving to regulate the unsteady combustion process.

Several key technical challenges must be overcome to realize the potential of CVC propulsion. These challenges include efficient detonation initiation, low total pressure loss detonation initiation devices, low total pressure loss air valves, thermal management systems, efficient nozzles, and control systems, to name a few. Recent advances in liquid hydrocarbon/air detonation ignition, low total pressure loss detonation transition devices, air valve and nozzle

(more)

demonstrations, computer modeling, measurement techniques and other factors provide a strong foundation for a successful Vulcan program.

A key objective of the DARPA program is to integrate the turbine engine into the Vulcan engine system with minimal modification to the turbine engine, operate the turbine engine from rest to its upper Mach limit and cocoon the turbine engine when it is not in use during flight. The turbine and CVC engines will share a common inlet and nozzle.

DARPA will use the results of the first phase of the Vulcan program to make decisions regarding future phases, which notionally could include a 18-month second phase for risk reduction testing of full-scale components and conclude with a preliminary design review of the CVC demonstration engine. This could be followed by 18 additional months for detailed design, fabrication and demonstration of the CVC engine system, with a final 18-month phase to design, build and demonstrate the full Vulcan system (the CVC engine integrated with the turbine engine).

-END-

Media with questions, please contact Jan Walker, (703) 696-2404, or jan.walker@darpa.mil. Contractors or military organizations, contact Dr. Thomas Bussing, (571) 218-4212.